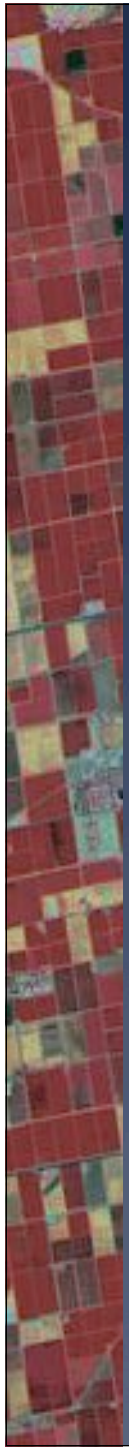
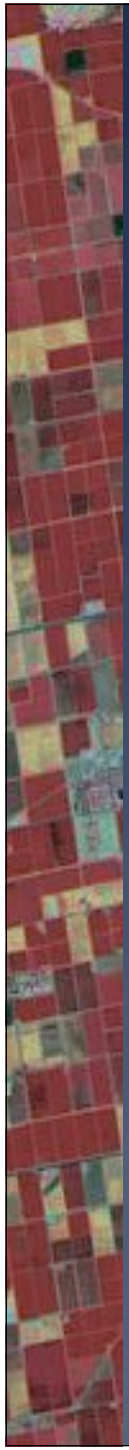


Remote sensing of agriculture in North Africa

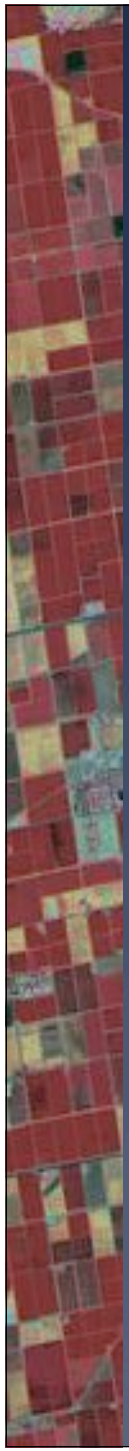
Mutlu Ozdogan
University of Wisconsin-Madison

December 4, 2013



What do we observe with remote sensing in cultivated areas?

- Operational status of satellites
- Objective assessment of fields
- Identify crop types and locations
- Estimate crop area
- Estimate productivity (yield)
- Estimate crop irrigation status
- Environmental assessment

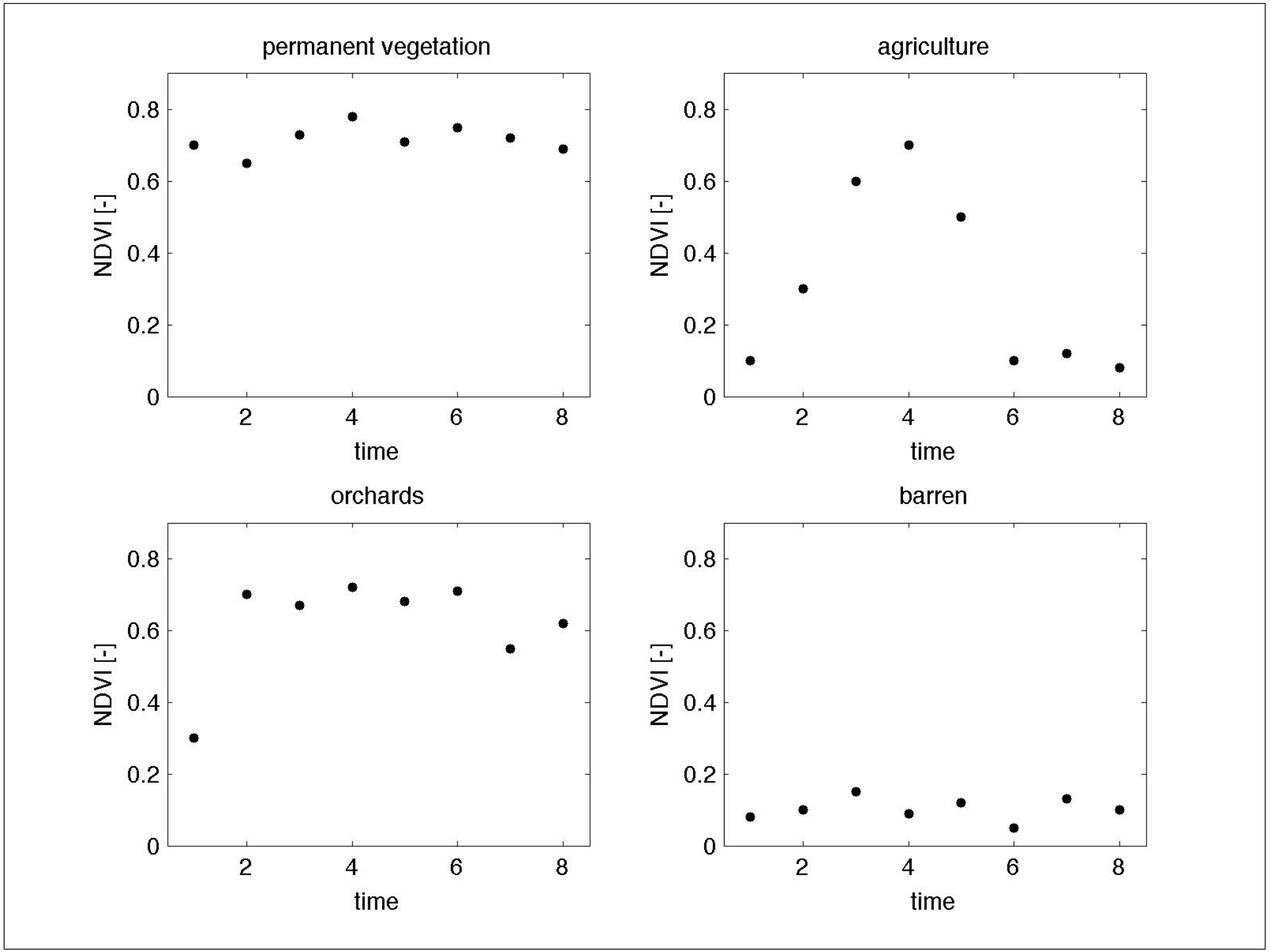


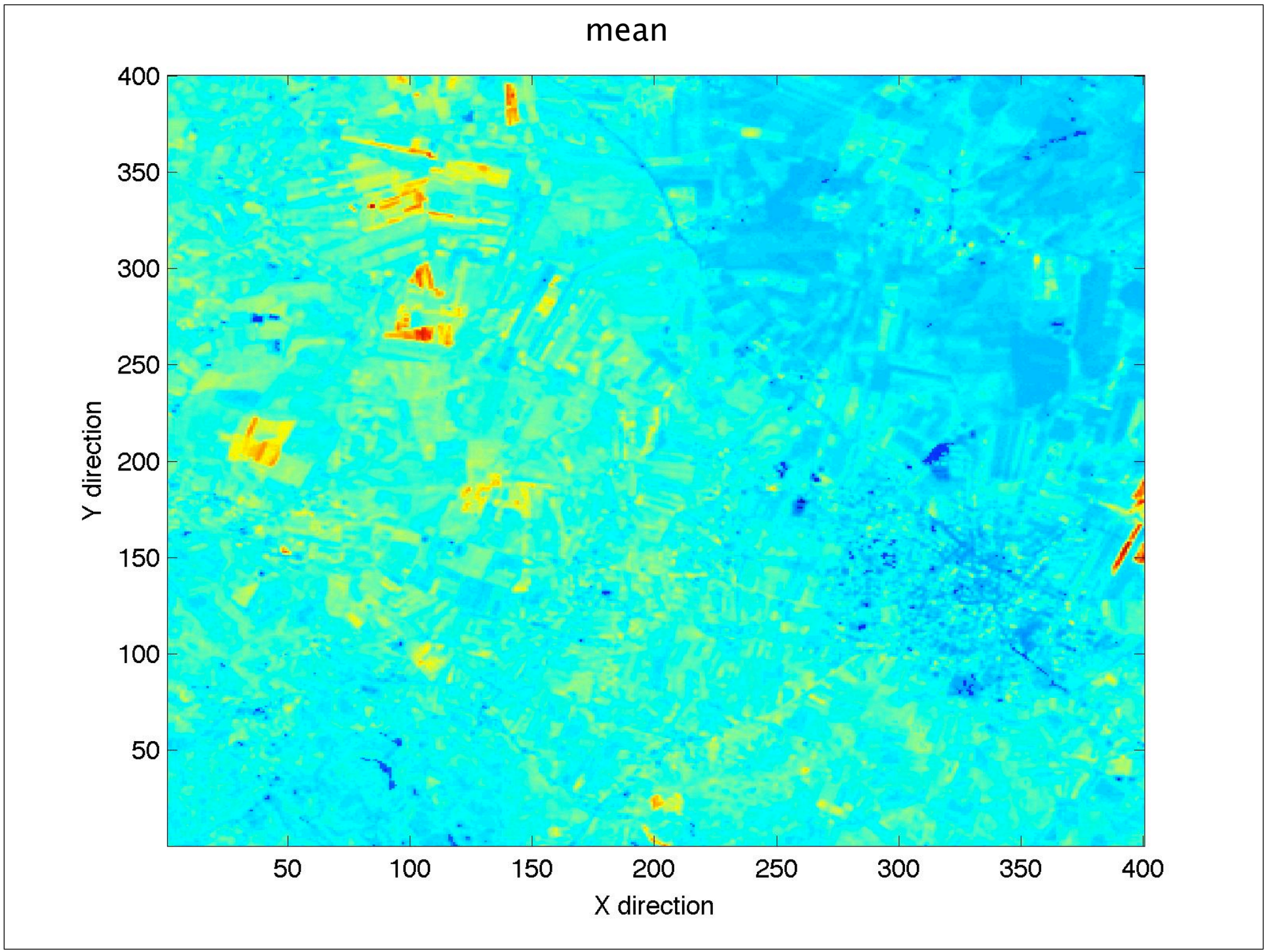
What are the tools and datasets?

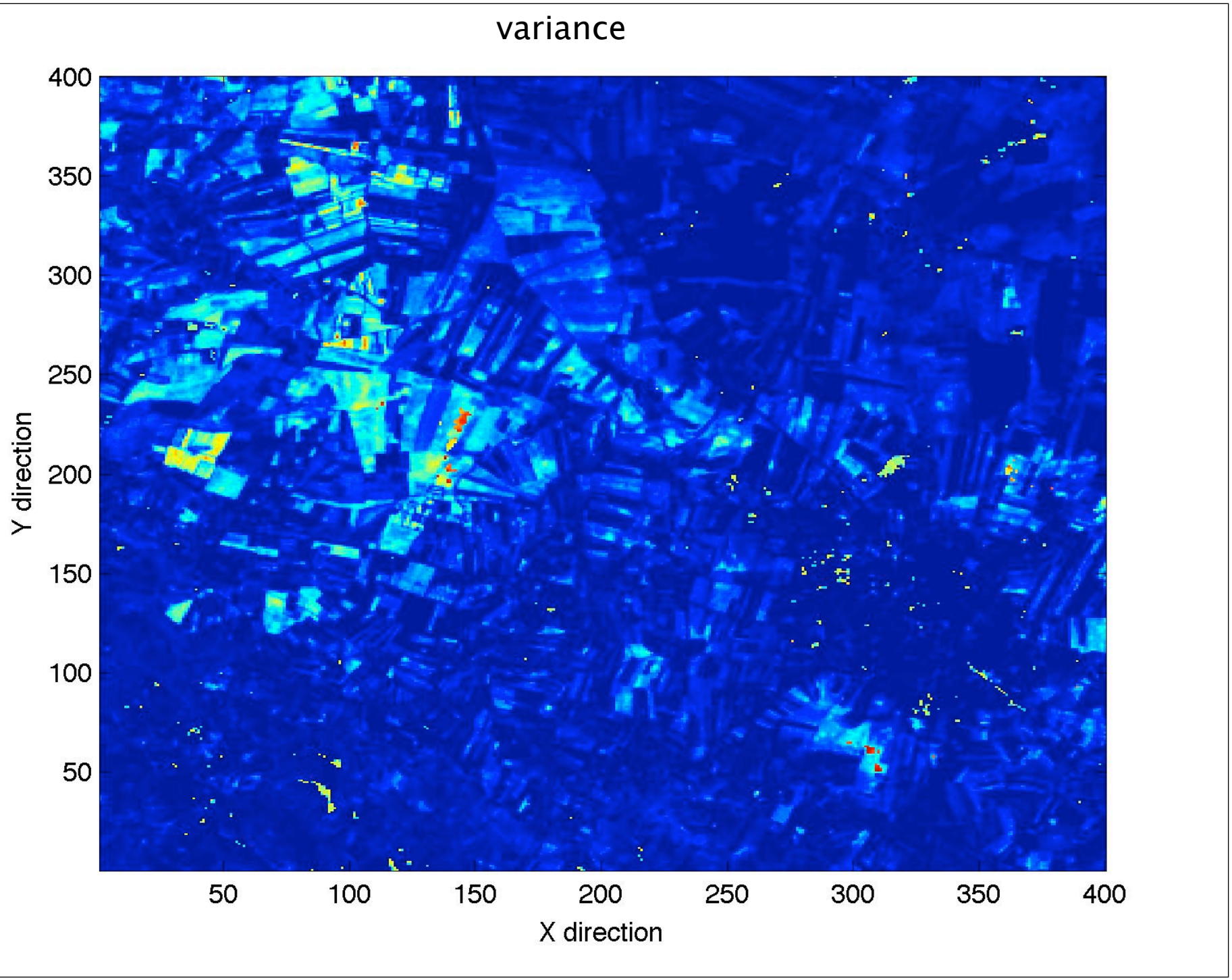
- Medium-spatial resolution datasets for operational monitoring (Landsat, SPOT)
- Tools include vegetation indices, classification, change detection
- Rely on multi-temporal dynamics of vegetation
- Extract crop-specific information

Hierarchical Approach

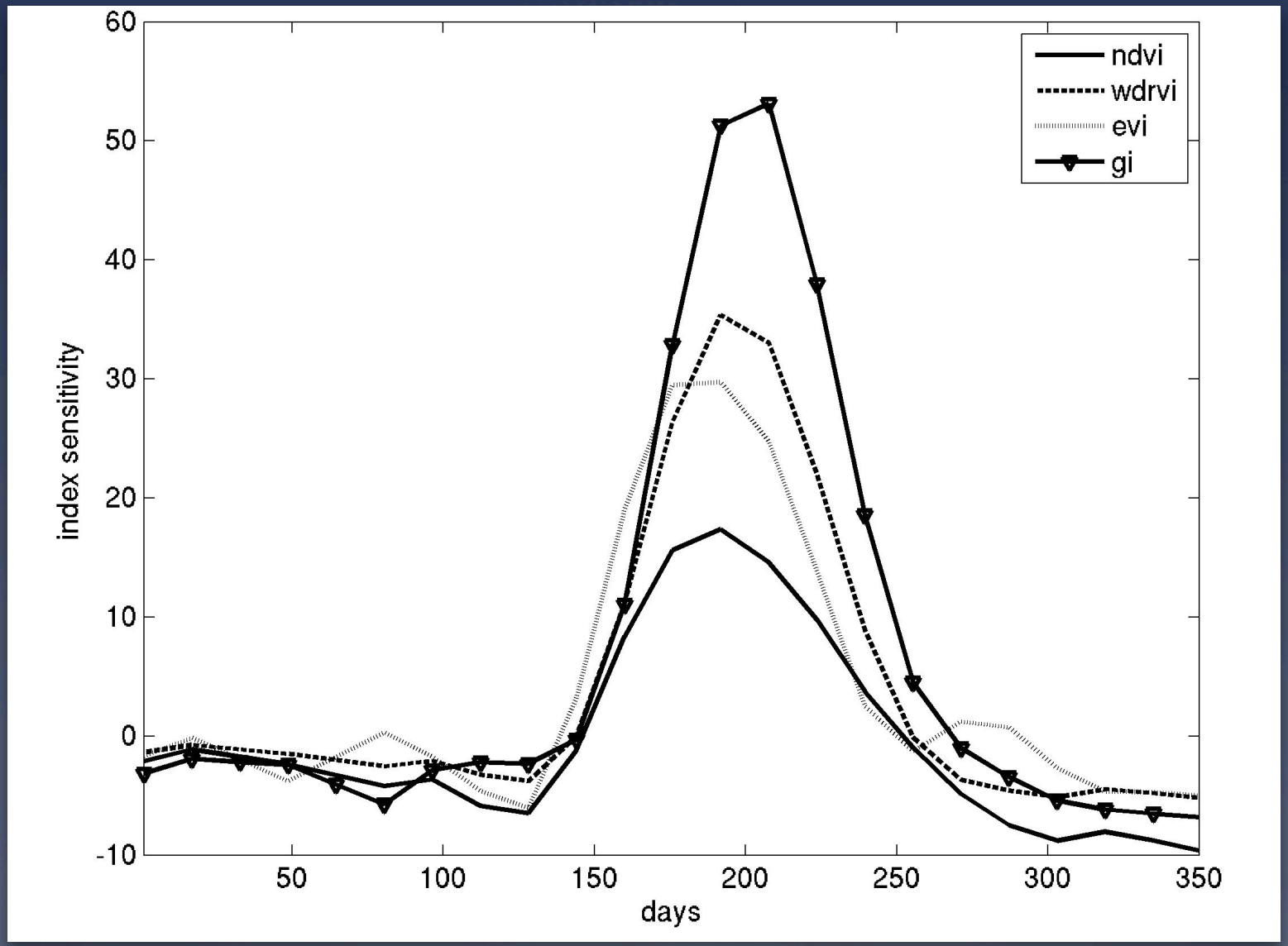
- Divide and conquer approach
- Take the landscape and use multitemporal statistics of vegetation indices to divide the landscape into major land cover types – inter-annual approach
- Once croplands are identified, use timing and amplitude of vegetation indices to identify irrigated areas – amplitude approach
- Once croplands are identified, use multitemporal vegetation indices along with agronomic information to identify crop types – intra-annual approach
-


permanent vegetation
agriculture
orchards
barren
NDVI [-]
time
0
0.2
0.4
0.6
0.8
2
4
6
8

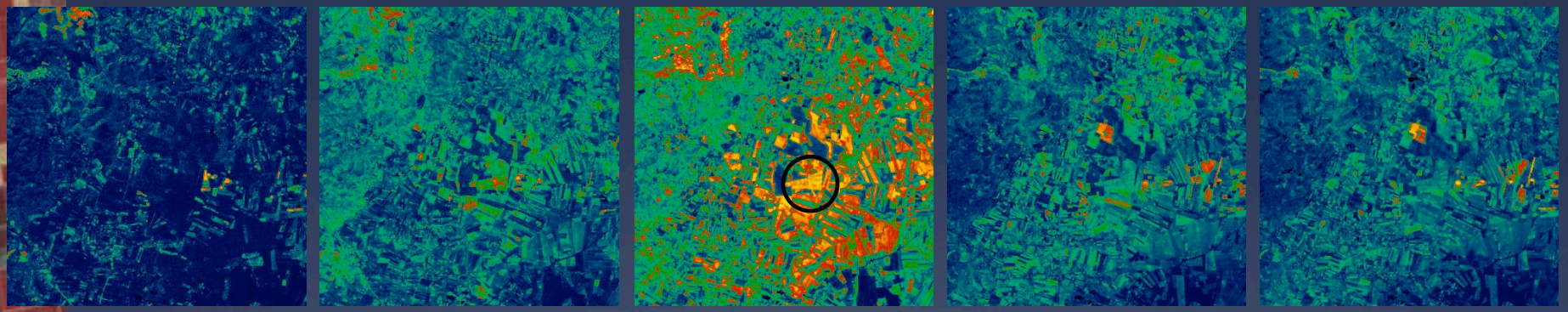

mean
400
350
300
250
200
150
100
50
Y direction
50
100
150
200
250
300
350
400
X direction


variance
400
350
300
250
200
150
100
50
Y direction
50
100
150
200
250
300
350
400
X direction

Irrigation sensing



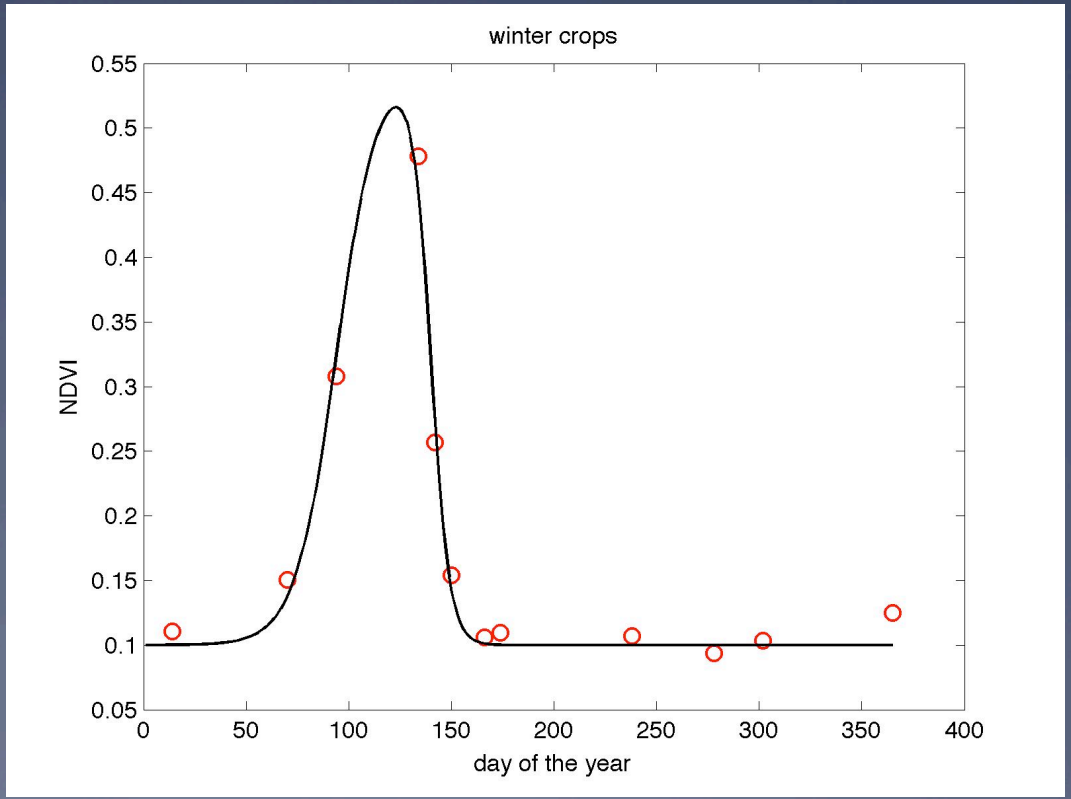
Winter crops (wheat)



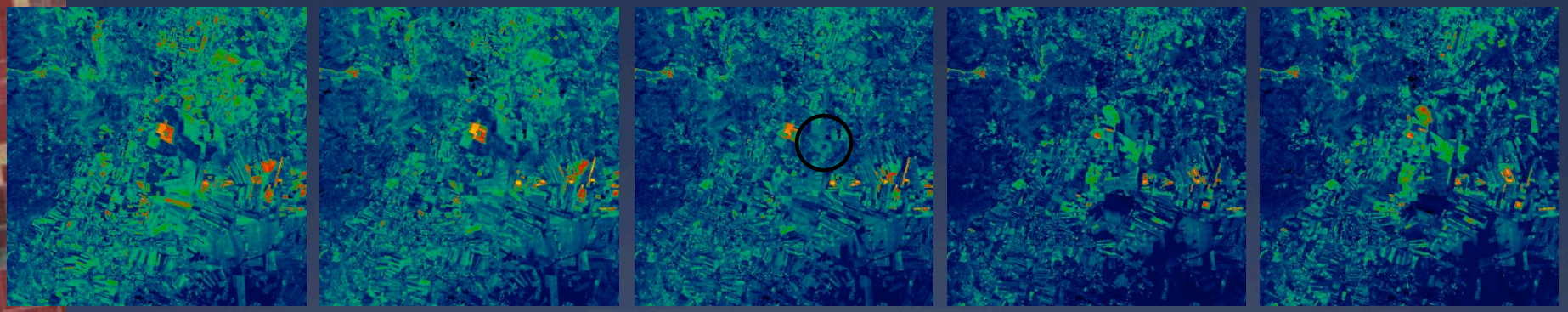
January 14, 2010 | March 10, 2010 | April 3, 2010 | May 13, 2010 | June 14, 2010

By assembling a time series of vegetation index data, we have the ability to map crop types and their irrigation status

In this case, the winter crops (winter wheat) are visible by their early green-up time period



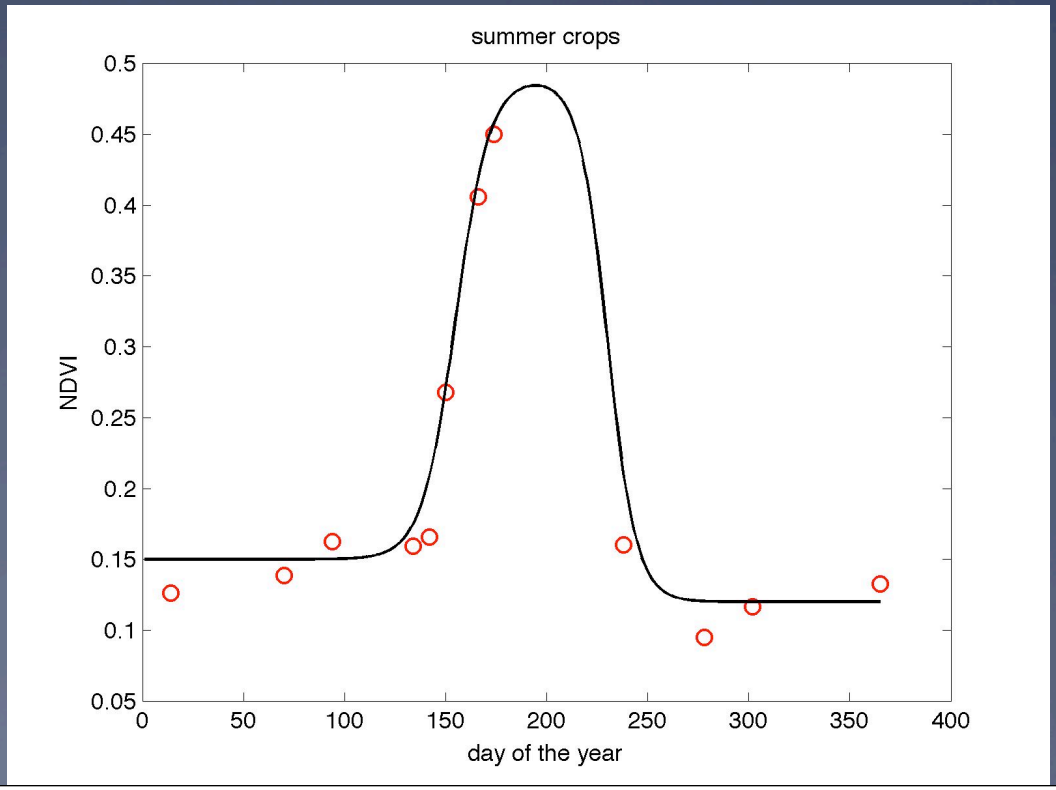
Summer crops (maize)



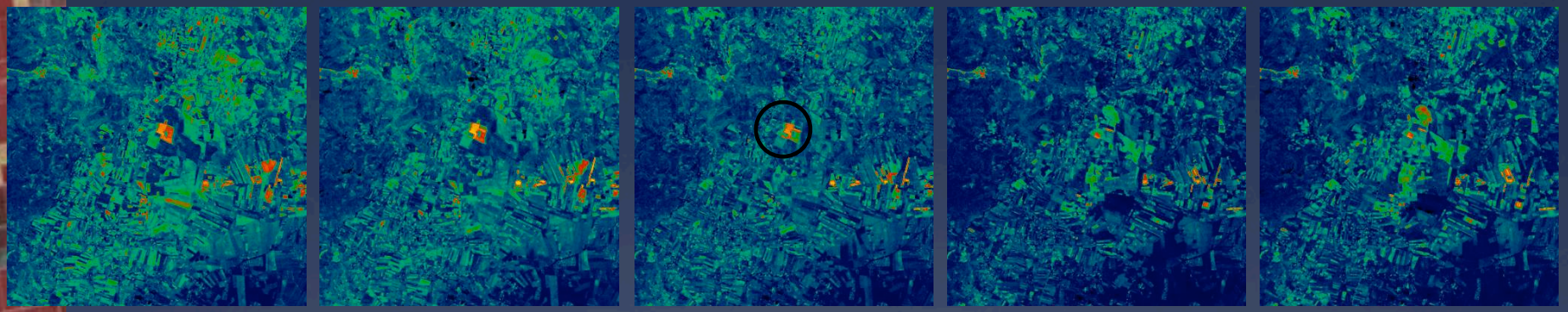
May 13, 2010 June 14, 2010

By assembling a time series of vegetation index data, we have the ability to map crop types and their irrigation status

In this case, the summer crops (maize?) are visible by their late green-up time period



Double cropping

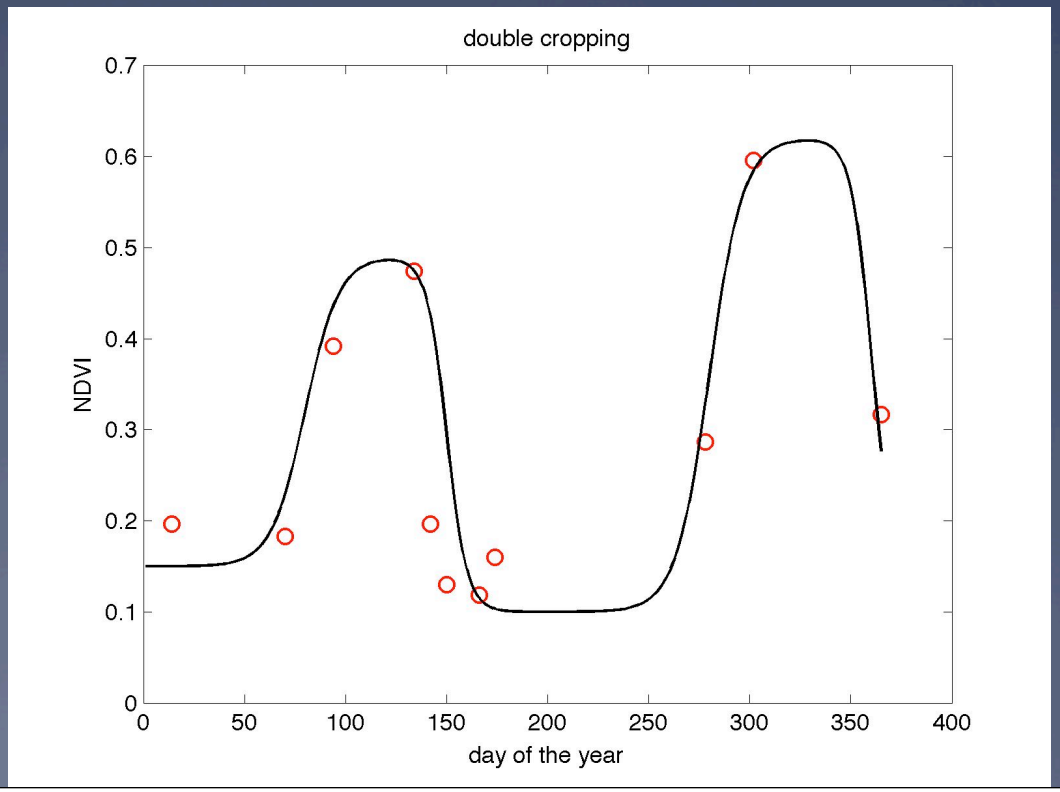


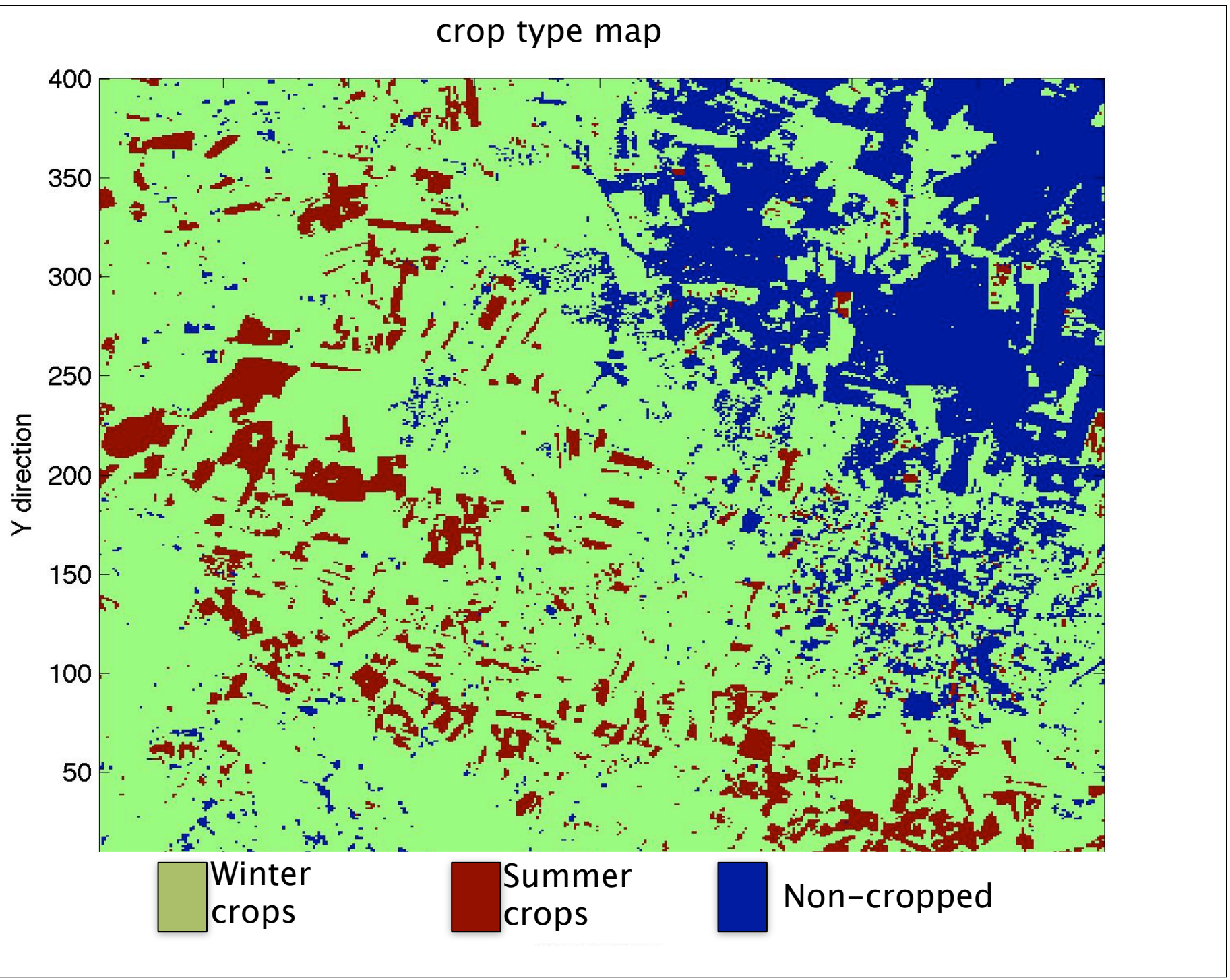
May 13, 2010 June 14, 2010

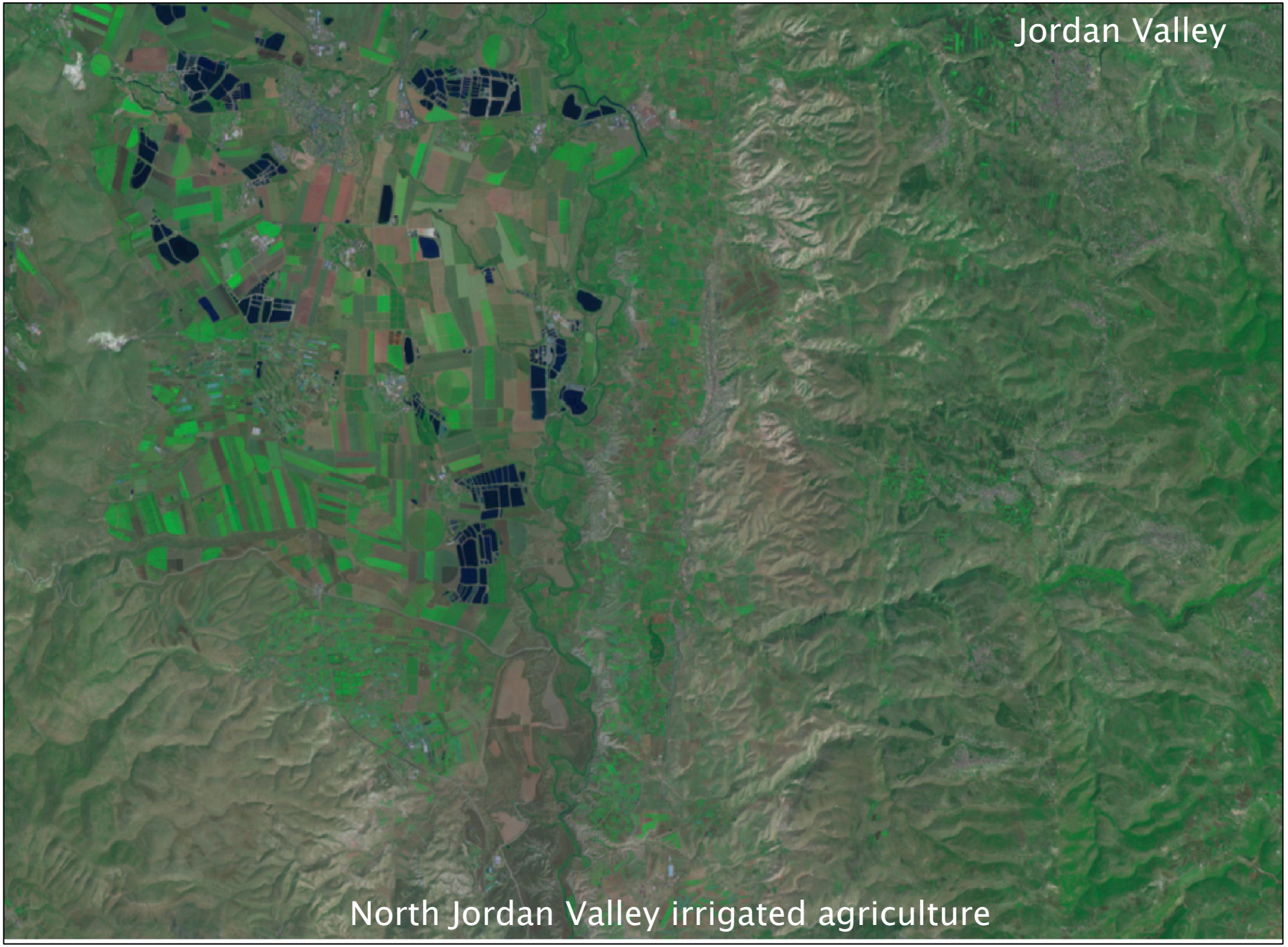
0 NDVI 1

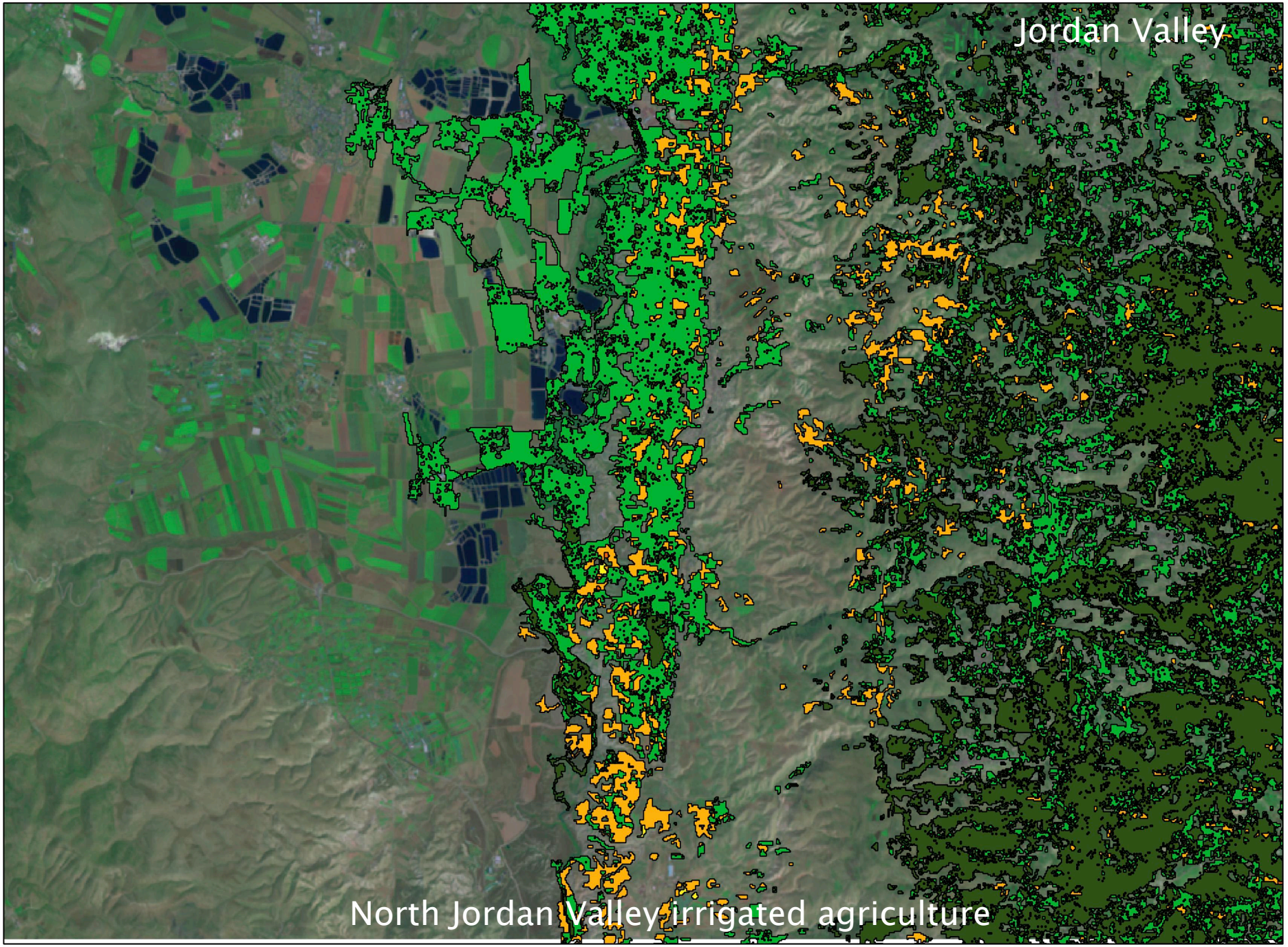
By assembling a time series of vegetation index data, we have the ability to map crop types and their irrigation status

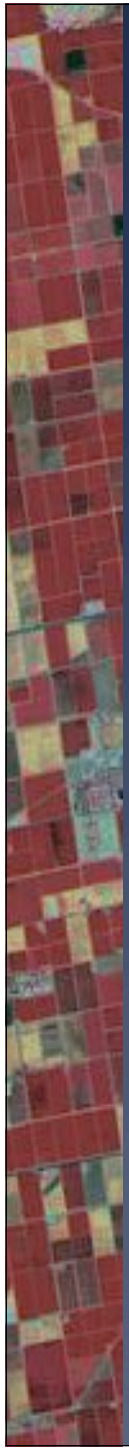
In this case, the double cropping is visible by distinct two growing cycles




crop type map
400
350
300
250
200
150
100
50
Y direction
Winter crops
Summer crops
Non-cropped

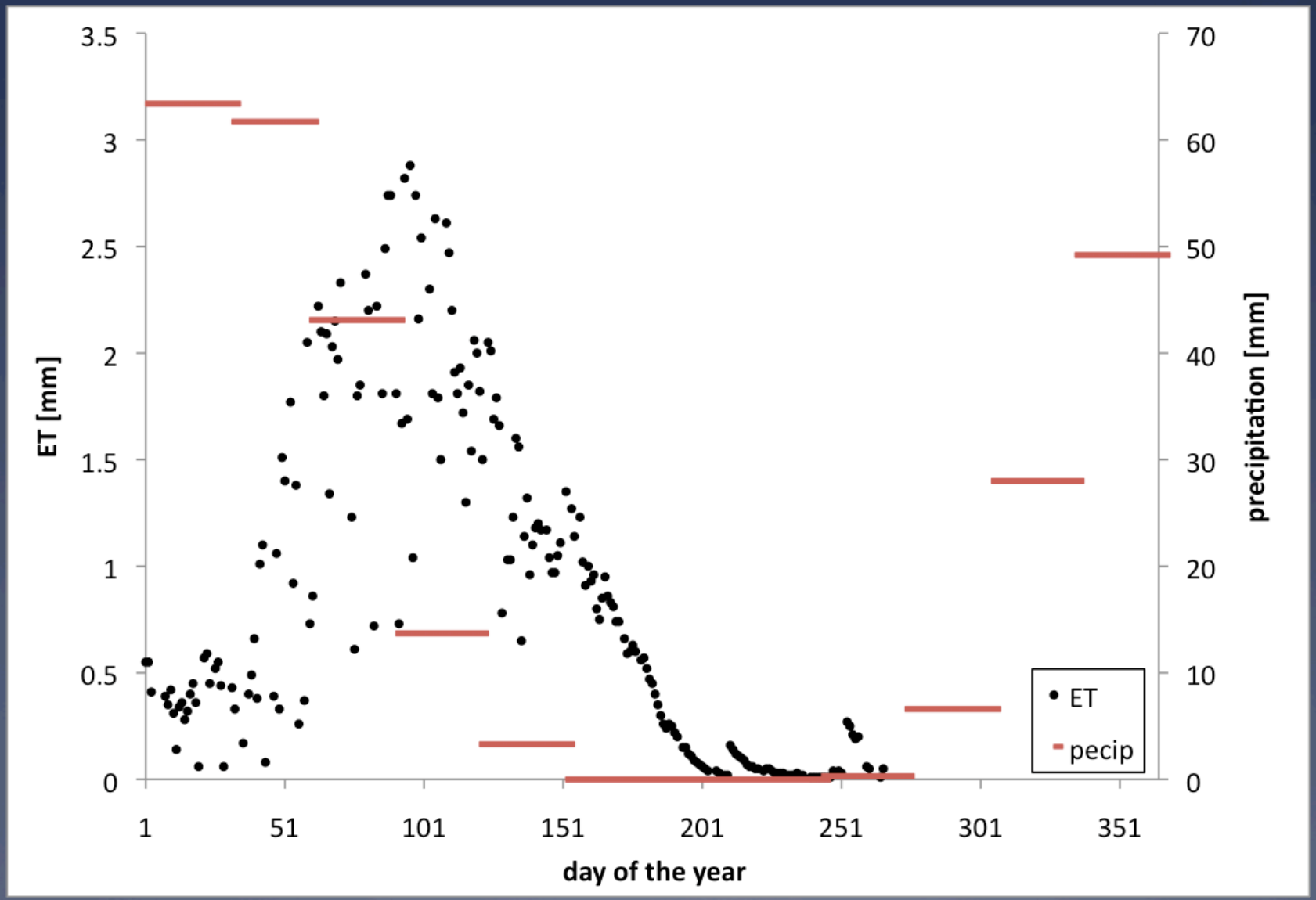

Jordan Valley
North Jordan Valley irrigated agriculture


Jordan Valley
North Jordan Valley irrigated agriculture

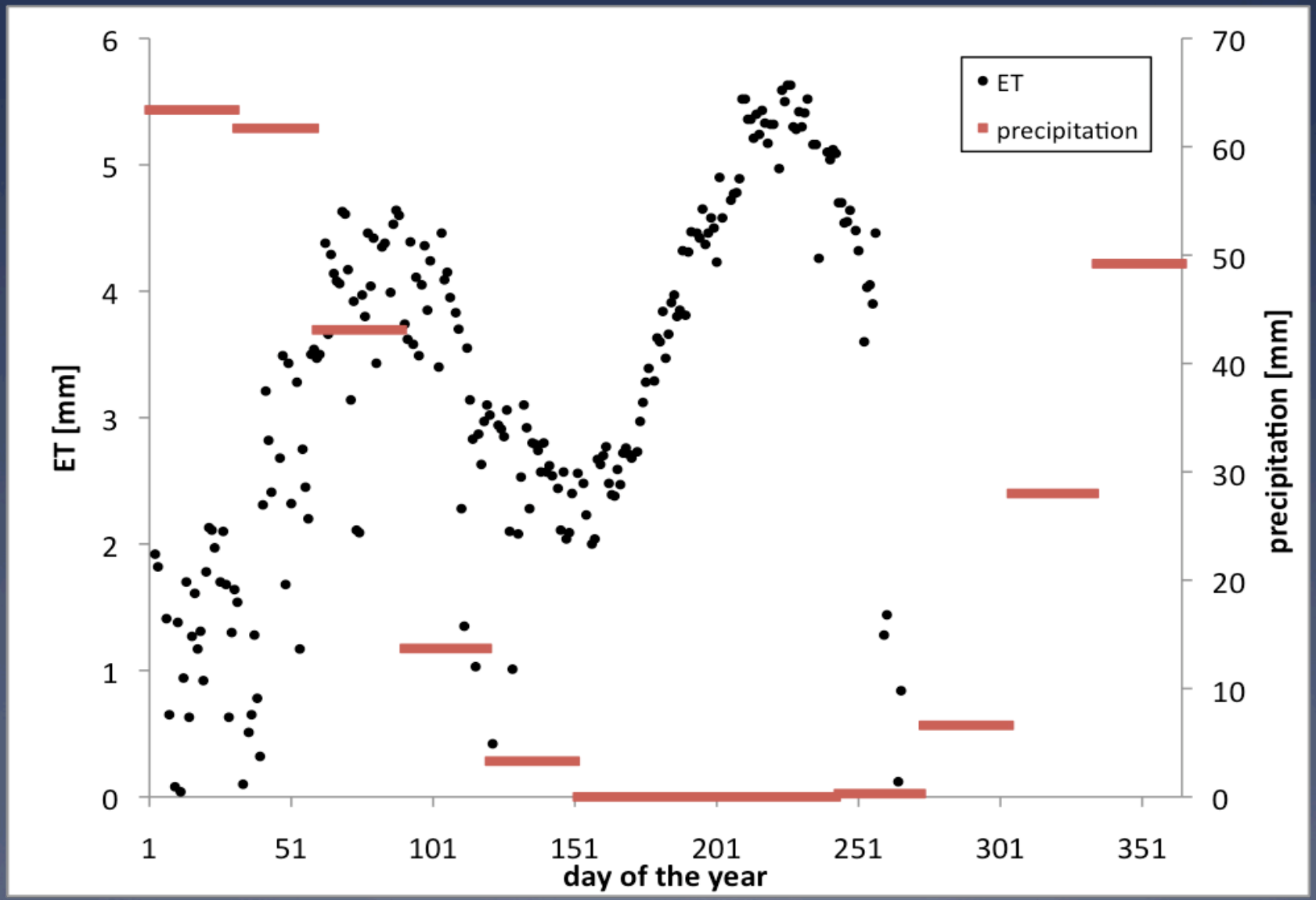


What about water use?

Non-crop water use



Irrigated water use



Summary

- Regional scale irrigation mapping completed and being used for hydrological modeling
- Local scale mapping is in progress but this will require local inputs from the users
- Crop type mapping is country specific – two crops are doable, more crops are work in progress
- Having a crop type map allows crop-specific water loss assessment which is a key input for agricultural water management